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- (1) Interchange rows 1 and 4;
- (2) Multiply row 2 by 4 and add to row 4;
- (3) Multiply row 2 by 5 and add to row 3;
- (4) Add row 1 to row 2;
- (5) Multiply row 2 by 5 and add to row 4;
- (6) Multiply row 2 by 7 and add to row 3.

The result is

$$\left\| \begin{array}{cccc|cccc} 1 & 5 & -2 & -1 & 0 & 0 & 0 & 1 \\ 0 & 2 & -1 & -1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & -5 & 0 & 12 & 1 & 7 \\ 0 & 0 & 0 & 0 & 1 & 9 & 0 & 5 \end{array} \right\|.$$

and the solution is  $x = \frac{1}{5}$ ,  $y = \frac{9}{5}$ ,  $z = 0$ .

If the "5" in the last row and column had come out a zero, the equations would have been inconsistent.

## PROBLEMS FOR SOLUTION.

SEND ALL COMMUNICATIONS ABOUT PROBLEMS TO B. F. FINKEL, Springfield, Missouri.

**2732. Proposed by PAUL CAPRON, U. S. Naval Academy.**

A conical cup, filled with a fluid, stands with the vertex on a smooth horizontal surface. The inner and outer surfaces of the cup are similar cones of revolution, having altitudes  $h$  and  $h(1+x)$ ; the ratio of the specific weights of the material of the cone and the fluid is  $\sigma$ ; the height of a barometer column of the fluid is  $h_0$ . Show that for equilibrium

$$h_0/h(1+x)^2 + \sigma x(1+x+x^2/3) < 2/3.$$

**2733. Proposed by J. L. RILEY, Stephenville, Texas.**

An ellipse of constant eccentricity passes through the focus of a parabola and has its foci on the curve. Find the envelopes of its axes.

**2734. Proposed by E. L. REES, The University of Kentucky.**

Given two circles tangent to each other externally. From the extremity of a diameter through the point of tangency, draw a secant such that the segment between the circles shall be equal to a given segment.

**2735. Proposed by H. B. PHILLIPS, Massachusetts Institute of Technology.**

If two lines  $AE$  and  $BD$ , drawn from the vertices,  $A$  and  $B$ , of a triangle to the opposite sides, divide the angles  $A$  and  $B$  so that the parts of  $A$  are respectively less than the corresponding parts of  $B$ , then  $AE$  is greater than  $BD$ .

**2736. Proposed by M. COHEN, Freshman, Johns Hopkins University.**

Prove by elementary geometry that the orthocenter, the centroid, and the circumcenter of a triangle lie on a line (the Euler line), and that the centroid lies between the other two and is twice as far from the orthocenter as from the circumcenter.